(54) **Spot-the-ball games**

(57) A method of producing an image for a spot-the-ball competition comprises storing a sequence of images in digital form on computer. The ball is identified on a selected image and an image from the sequence before or after the selected image in which the ball is not at the same location is used to create a new image in which the portion of the image where the ball is located is replaced by a corresponding portion from the other image. The computer stores the coordinates of the missing ball. A grid is then superimposed on the image by generating a pseudo-random number and locating a numbered grid over the image so that the square corresponding to the random number lies over the missing ball.
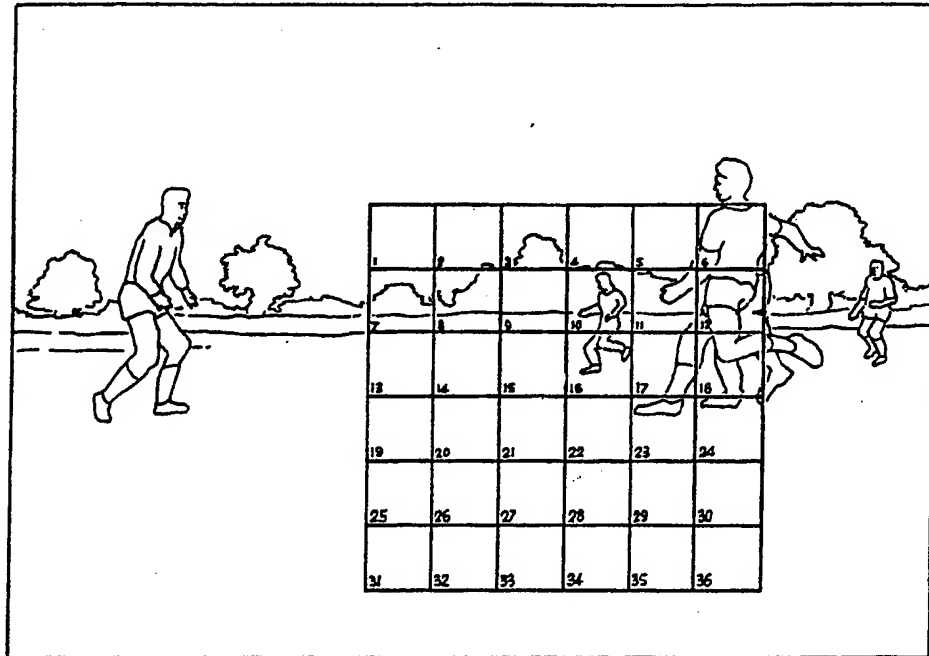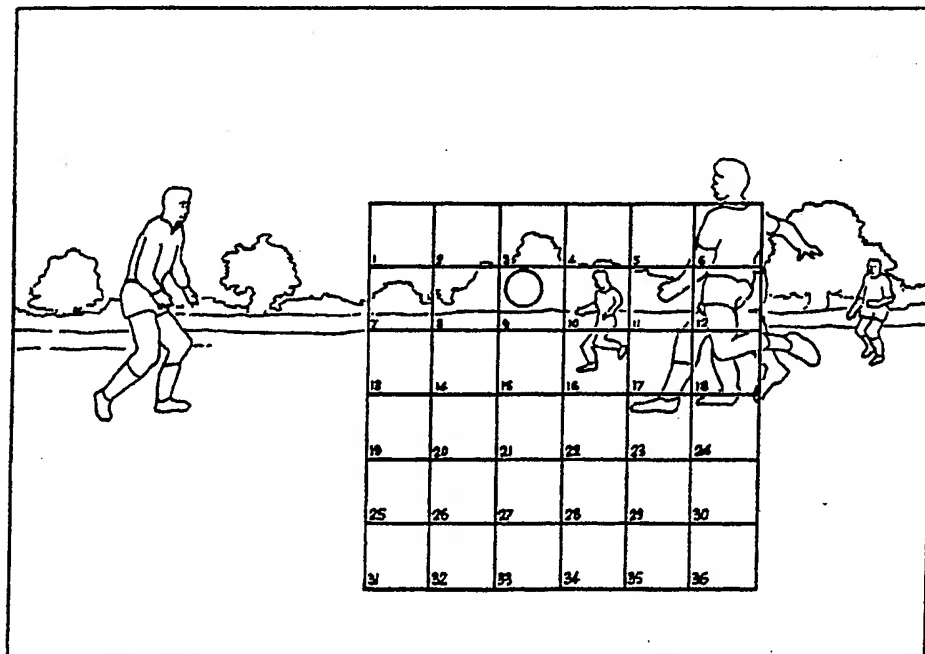
Fig.1.

Fig.2.

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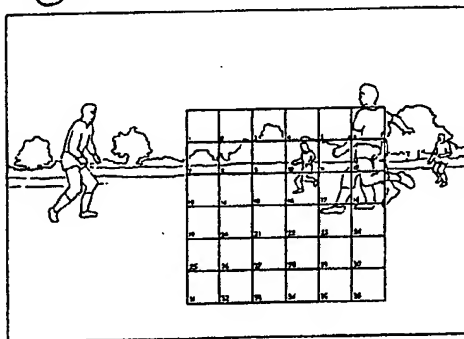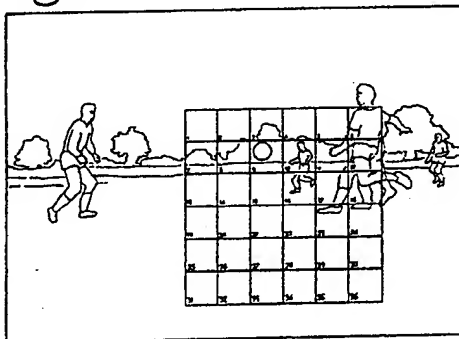
Fig.1.

Fig.2.

METHOD OF PREPARING AN IMAGE FOR A SPOT-THE-BALL COMPETITION

The present invention relates to a method of preparing an image for use in a spot-the-ball competition.

In this specification the term 'spot-the-ball type' competition is used to cover a competition in which the entrant has to use his skill and judgement to determine the location of an object which has been removed from an image. The location of the missing object which the entrant has to use his skill and judgement to determine may be the actual location from where the object has been removed, or it may be the location where an expert or a panel of experts judge the location of the object to have been. The object which has been removed from the image may be a ball or other object. The image may be a scene from a football match, tennis match or other event. The image may be a photograph or a video image on a video monitor.

The traditional way of producing images for spot-the-ball competitions is to take a conventional photograph of an event such as a scene from football match and touch-up the photograph manually to eliminate the ball. Such a technique is time consuming and requires a skilled operator. It is unsuitable if a large number of images with objects eliminated are required.

According to the present invention, in one aspect, a method of producing an image for a spot-the-ball competition comprises storing a sequence of images of an event in which a moving object is to be eliminated, identifying the object to be eliminated, selecting an image from which the identified object is to be eliminated, creating an image with the object removed by replacing the portion of the selected image where

- 1 -

the object is located with a corresponding portion or
corresponding portions of other images in the sequence before
or after the selected image in which the object is not at the
same location as in the selected image.

The sequence of images may be provided by a cinematograph film
or a sequence of still photographs taken from the same
viewpoint at short intervals. Alternatively, it may be a
video recording. The sequence of images is on film or video
preferably converted into a series of digital images stored in
a computer.

The computer maybe programmed to identify the object to be
eliminated itself, for example by identifying a circular
moving shape. Alternatively, the object may be identified by
an operator and the computer may then perform the construction
of the image with the object eliminated automatically. The
identification of the image may, for example be performed by
an operator viewing the sequence of images on a computer
monitor and moving a cursor to the location of the object to
be eliminated. The computer may then "lock-on" to the object
and track it through the sequence of images.

The computer may construct several images with the object
missing from a given sequence of images. Once the object has
been located the computer can follow the object from image to
image, select the images from which the object is to be
eliminated and move backwards or forwards in the sequence to
find images where the object is not to be found at the same
location as in the selected image so that the background can
be reconstructed in the area where the object has been
eliminated. Usually the eliminated object will be a ball.

The computer may be arranged to store the images from which

the object has been eliminated together with the co-ordinates of the missing object on each image. In this way, after the competition has been held, the co-ordinates of the missing object may be retrieved so that the entries to the competition may be compared with the true location of the object.

In some spot-the-ball competitions, the aim is not to determine the true location of the ball, but to determine the location where an expert or a panel of experts judges the ball to be. In this case, it will not be necessary to record the true location of the ball in the computer, but the co-ordinates of the location as determined by the expert may be fed into the computer at a later date.

The images with objects eliminated may be stored by the computer until required. It may be found that some of the images generated may not be satisfactory for use in a spot-the-ball competition. For example, if the ball is eliminated from in front of a player who is himself moving across the picture at a speed similar to the speed of the ball, the background may not be correctly reconstructed. Other images may be unsatisfactory from an aesthetic point of view. For this reason, it is preferred to print out the images generated as described above and stored in the computer to check them visually and then to eliminate from the computer memory any images that are considered to be unacceptable. Each image may be automatically given a serial or reference number by the computer which is then printed on the prints for ease of identification.

Once the object has been located and the computer has locked onto it, it will not be necessary for the operator to view the sequence of images unless the computer loses track of the object, for example when it passes behind another object or

when there is a change of scene in the sequence of images. It
may be desirable that the screen of the computer monitor
should be wholly or partially blanked out after the object has
been identified so that the operator does not see the images
from which the object has been eliminated. This gives the
system added security for a spot-the-ball competition since
only the computer will know the location of the missing
object.

In patent no. GB-A-1604651 a variation of the spot-the-ball
game is described in which the photograph is divided into a
number of zones and the entrant merely has to identify the
zone in which the ball is located. For each entry the entrant
has to guess the zone into which the ball falls for several
different photographs. The entrant indicates his selection on
an entry coupon which is despatched for checking by the
organisers in the usual way.

The present invention in a second aspect provides a method of
producing an image for a spot-the-ball competition in which a
grid is superimposed on the image.

According to the present invention in its second aspect, a
method of producing an image for use in a spot-the-ball
competition comprises storing images of events from which an
object has been eliminated in a computer together with the
co-ordinates of the location on the image from which the
object has been eliminated or is deemed to have been
eliminated, generating a number in the computer, producing an
image from the computer of one of the stored images with a
grid of predetermined dimensions superimposed, the grid being
located on the image so that the square corresponding in
number to the number generated by the computer is located at
the co-ordinates from which the object has been eliminated.

The number generated by the computer may be chosen
pseudo-randomly. The number may be any value up to the total
number of squares on the grid. The squares on the grid may be
numbered sequentially and the numbers may appear with the
grid.

In the preferred form of the invention the grid will not cover
the whole of the image. There may be a tendency for entrants
to favour particular parts of the image regardless of what
appears in the image. For example, it may be found that right
handed people have a tendency to make entries on the right
hand side of the image. By moving the grid relative to the
picture product the gridded image with the location of the
ball in a square chosen by the computer at random, and by
showing more of the image than the gridded area, any bias
towards particular squares due to such effects will be
eliminated. This is particularly important where the location
of the object for the correct solution is that chosen by an
expert or a panel of experts rather than the true position.
The expert can determine the location of the ball before the
grid has been applied. As the grid is applied subsequently
and the location of the square is chosen at random any bias of
the expert in favour of particular locations is eliminated.

In carring out the invention one might proceed as follows.

A video recording of a football match is made. The recording
is then played on video reproducing equipment linked to a
computer. The recording can be viewed by an operator on a
t.v. monitor. The computer generates a cursor on the t.v.
monitor which can be moved by the operator by means of a
"mouse". While the recording is stopped to freeze a frame and
the operator moves the curser to locate it over the ball. He

then presses an "action" button on the mouse to indicate to
the computer that he has located the ball. From then the
screen goes blank apart from the area covered by the cursor.
The computer program operates to follow the ball through
subsequent frames and to drive the cursor so that it follows
the ball on the screen. If the computer detects that the
track has lost the ball, the whole screen is lit up again to
enable the operator to move the cursor to the position of the
ball.

The computer samples the video image at intervals and converts
it into a digital image stored in the computer. It also
records the co-ordinates of the ball for each sampled image.
The computer processes the images thus stored to produce
further stores images from which the ball has been removed.
This is done by replacing an area of the selected image
surrounding the ball with the corresponding area taken from
the nearest frame, before or after the selected image, in
which the ball has moved outside the said area. The images
thus formed are stored digitally by the computer with the
co-ordinates of the ball for each selected image. The
computer allocates each image thus formed a reference numeral
and produces a print out of the image bearing the reference
numerals.

The operator then selects those prints which appear to be
satisfactory for use in a spot the ball competition and
instructs the computer to delete all other images from its
memory so that the memory does not become overloaded with
unsuitable images.

The next stage is to produce prints of the image with a grid
superimposed, for use as the master prints in the competition.
In this example a 6x6 grid is used for the competition. The

grid is substantially smaller than the image. The squares are numbered across and down from 1 to 36. The computer is programmed to produce a random number from 1 to 36. The computer selects one of the digitalised images from its memory. It determines whether the grid would fit onto the photograph if the square corresponding to the random number generated were centred over the location from where the ball has been removed. If it will, it prints the image on a laser printer with the numbered grid superimposed. If it will not it generates another random number and trys to position the grid again only this time with the square corresponding to the new number over the ball. Figure 1 shows an example of a gridded print produced by this method, and figure 2 shows how the print would have appeared if the ball had not been removed.

When one image has been reproduced with a grid, the computer moves on to the next image in its memory and thus produces automatically a series of prints for use in a spot-the-ball type competition such as described in patent no. GB-A-1604651 or my co-pending patent application no. 89 l 4 2 6 l

Claims

1. A method of producing an image for a spot-the-ball type competition comprising storing a sequence of images of an event from which a moving object is to be eliminated, identifying the object to be eliminated, selecting an image from which the object is to be eliminated, creating an image with the object removed by replacing the portion of the selected image where the object is located with a corresponding portion or corresponding portions of other images in the sequence, before or after the selected image, in which the object is not at the same location as the selected image.

2. A method according to claim 1 in which the sequence of images is a cinematographic film or a sequence of still photographs taken from the same viewpoint at short intervals.

3. A method according to claim 1 in which the sequence of images is a video recording.

4. A method according to claim 1, 2 or 3 in which the sequence of images is converted into a series of digital images stored on computer.

5. A method according to claim 4 in which the computer is programmed to identify the object to be eliminated.

6. A method according to claim 5 in which the computer is programmed to identify a circular moving shape as the object to be eliminated.

7. A method according to claim 5 in which the object to be eliminated is identified by an operator and the computer then performs the construction of an image with the object eliminated automatically.

8. A method according to claim 7 in which the operator views the sequence of images on a computer monitor and moves a cursor on the screen of the monitor to the location of the object to be eliminated, the computer then locking onto the object and tracking it through the sequence of images.

9. A method according to any of the claims 4 to 8 in which the computer constructs several different images with the object eliminated, from a

-8-

given sequence of images.

10. A method according to any of claims 4 to 9 in which the images with the objects eliminated are stored in the computer together with the coordinates of the missing object for each image.

11. A method of producing an image for use in a spot-the baal type competition comprising storing images of an event from which an object has been eliminated in a computer together with the coordinates of the location from which the object has been eliminated or is deemed to have been eliminated, generating a number in the computer, producing an image from the computer of one of the stored images with a grid of predetermined dimensions superimposed upon it, the grid being located on the image so that the square corresponding in number to the number generated by the computer is located at the coordinates from which the object has been eliminated.

12. A method according to claim 11 in which the number is generated pseudo-randomly.

13. A method according to claim 11 or 12 in which the squares are numbered sequentially and the numbers appear with the grid.

14. A method according to any of claims 11 to 1 in which the grid does not cover the whole image.

15. A method of producing an image for a spot-the-ball type competition substantially as hereinbefore described with reference to the accompanying drawings.